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REMARKS / DISCUSSION OF ISSUES

Claims 1-49 are pending in the application.

The Office action rejects claims 43-49 under 35 U.S.C. 101. The applicants respectfully traverse this rejection.

The Office action asserts that claims directed to a signal are not patentable subject matter.

The Examiner's attention is requested to MPEP section 2106 (4) (B) (1), last sentence, which clearly states:

> "a signal claim directed to a practical application of electromagnetic energy is statutory regardless of its transitory nature. See *O'Reilly*, 56 U.S. at 114-19; *In re Breslow*, 616 F.2d 516, 519-21, 205 USPQ 221, 225-26 (CCPA 1980)."

Because signal claims are recognized in the MPEP as statutory subject matter, the applicants respectfully request the Examiner's reconsideration of the rejection of claim 43-49 under 35 U.S.C. 101.

The Office action rejects claims 5, 7, 11, 13, 27, 28, 32, and 34 under 35 U.S.C. 112, first paragraph, for reference to "minimized" interference. These claims are correspondingly amended herein. The applicants teach avoiding interference with the demodulation of the data signal without reference to the one or more supplemental signals by transmitting the supplemental signals, for example, at a power level of -30dB below the data signal's power level.

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The Office action rejects claims 8, 14, 29, 35, 43, 48, and 49 under 35 U.S.C. 102(e) over Emi (USP 6,148,020). The applicants respectfully traverse this rejection.

MPEP 2131 states:

> "A claim is anticipated only if ***each and every element*** as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The ***identical invention*** must be shown in as ***complete detail*** as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

Claim 8, upon which claims 9-14 depend, claims a transmitter that includes a symbol source producing a data signal; a waveform generator producing a time-varying signal that changes frequency during each of a plurality of periods, and a modulator producing a transmission signal from a sum of the data signal and the time-varying signal.

Claim 29, upon which claims 30-35 depend, also includes producing a transmission signal from a sum of the data signal and a multi-frequency time-varying signal.

Claim 43, upon which claims 44-49 depend, claims a signal that includes at least one multi-frequency supplemental signal summed with a data signal.

Emi fails to teach a sum of a data signal and a time-varying/supplemental signal.

Emi teaches a conventional spread-spectrum encoding, wherein the data signal is multiplied by a time-varying signal. Although Emi does not use the term "multiply", and instead uses the term "mixer", the schematic symbol of Emi's mixer 18 clearly indicates a multiplier, whereas the applicants' element 203 is clearly illustrated using a schematic symbol for an adder, and is referred to throughout the applicants' specification as an adder.

By using an adder, the time-varying signal is combined with the data at the 'baseband' of the data signal, which achieves a number of advantages, particularly compatibility with "legacy" receivers 103, and allowing direct measurement of the interference that affects baseband signals.

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Because Emi fails to teach a sum of a data signal and a multi-frequency time-varying/supplemental signal, as specifically claimed in each of claims 8, 29, and 43, the applicants respectfully maintain that the rejection of claims 8, 14, 29, 35, 43, 48, and 49 under 35 U.S.C. 102(e) over Emi is unfounded, per MPEP 2131.

The Office action rejects claims 1 and 22 under 35 U.S.C. 103(a) over Birru (USP 6,912, 258) and Nilsson (USP 6,853,689). The applicants respectfully traverse this rejection.

MPEP 2142 states:

> "To establish a *prima facie* case of obviousness ... the prior art reference (or references when combined) ***must teach or suggest all the claim limitations***... If the examiner does not produce a *prima facie* case, the applicant is under no obligation to submit evidence of nonobviousness."

Claim 1 claims a system that includes a transmitter that is configured to produce a modulated data signal that includes an addition of one or more supplemental signals on a plurality of frequencies to an input data signal within a monocarrier channel employed to transmit the modulated data signal.

Claim 22 claims a method of communication that includes adding one or more supplemental signals on a plurality of frequencies to a data signal within a monocarrier channel.

Both Birru and Nilsson fail to teach the addition of one or more supplemental signals on a plurality of frequencies to a data signal.

As noted in the Office action, Birru is silent with regard to the creation of the signals that are transmitted to Birru's receiver. There is no indication in Birru that the received signals include one or more supplemental signals on a plurality of frequencies that are added to a data signal within a monocarrier channel.

Nilsson teaches the conventional use of pilot signals that include several pilot frequencies. However, as is known in the art, pilot signals are separate and independent of data signals, and Nilsson provides no teaching to contradict this conventional use of pilot signals, and specifically does not teach that these pilot signals are added to data signals.

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Because both Birru and Nilsson fail to teach the addition of one or more supplemental signals on a plurality of frequencies to a data signal, as specifically claimed in each of claims 1 and 22, the applicants respectfully maintain that the rejection of claims 1 and 22 under 35 U.S.C. 103(a) over Birru and Nilsson is unfounded, per MPEP 2142.

The Office action rejects claims 15-18 and 36-39 under 35 U.S.C. 103(a) over Laroia et al. (USPA 2002/0044524, hereinafter Laroia) and Li (USP 6,654,429). The applicants respectfully traverse this rejection.

Claim 15, upon which claims 16-21 depend, claims a receiver that includes a coherent demodulator producing a channel estimate from a received signal and a time-varying signal corresponding to a portion of the received signal.

The Office action relies upon Laroia for teaching a coherent demodulator to produce a channel estimate from a received signal and a time-varying signal corresponding to a portion of the received signal.

Laroia fails to teach a coherent demodulator.

The Office action asserts that Laroia's blocks 112 and 114 (FIG. 1) form a coherent demodulator that produces a channel estimate from a received signal and a time-varying signal corresponding to a portion of the received signal. The applicants respectfully disagree with this assertion.

Laroia specifically teaches, at paragraph [0008]:

> "[The signal] is supplied to the transform circuit 110, e.g., an FFT or DCT circuit, which converts the time domain signal representing the transmitted symbols into the frequency domain. Training symbol extractor 112 extracts one or more training symbols or pilot tones, i.e., symbols or tones with known transmitted values in the frequency domain, from the received signal. The extracted training symbols/tones are supplied to the frequency domain channel estimation circuit 114. The circuit 114 estimates the effect, in the frequency domain, of the communications channel on the transmitted signals as evidenced by the difference between the between the received training symbol(s) or pilot tone(s) and the expect values."

As can be seen, Laroia specifically teaches determining the channel estimate based on a fast-Fourier transform (FFT) or a discrete-cosine-transform (DCT),

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followed by a tone extraction, and is silent with regard to the use of a coherent demodulator to determine the channel estimate.

Because Laroia fails to teach a coherent demodulator, as relied upon in the Office action to support the rejection of claims 15-18 under 35 U.S.C. 103(a) over Laroia and Li, the applicants respectfully maintain that this rejection of claims 15-18 is unfounded, per MPEP 2142.

Claim 36, upon which claims 37-42 depend, claims a method that includes receiving a received signal that includes a data signal and a concurrently transmitted equalization signal; generating a time-varying signal corresponding to an equalization signal; and producing a channel estimate from the received signal and the time-varying signal.

Both Laroia and Li fail to teach or suggest producing a channel estimate based on a received signal that includes a data signal and a concurrently transmitted equalization signal.

Both Laroia and Li teach the conventional use of pilot symbols that are inserted between data symbols (Laroia, paragraph [0008] and Li, column 2, lines 34-37). Neither Laroia nor Li teaches or suggests concurrently transmitting an equalization signal with a data signal.

Because both Laroia and Li fail to teach or suggest producing a channel estimate based on a received signal that includes a data signal and a concurrently transmitted equalization signal, as specifically claimed in claim 36, the applicants respectfully maintain that the rejection of claims 36-39 under 35 U.S.C. 103(a) over Laroia and Li is unfounded, per MPEP 2142.

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In view of the foregoing, the applicants respectfully request that the Examiner withdraw the rejections of record, allow all the pending claims, and find the application to be in condition for allowance. If any points remain in issue that may best be resolved through a personal or telephonic interview, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

Respectfully submitted,

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